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PATENT DOCKET ADMINISTRATION
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EXAMINER	
YAM, STEPHEN K	
ART UNIT	**PAPER NUMBER**
2878	

DATE MAILED: 09/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/099,705	HALMOS, MAURICE J.
	Examiner	**Art Unit**
	Stephen Yam	2878

Ne

-- Th MAILING DATE of this communication appears on th cover sh et with the correspond nc address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 25 June 2003 .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-18 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-18 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

This action is in response to Amendments and remarks filed on June 25, 2003. Claims 1-18 are currently pending.

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the *synthetic aperture* laser transmitter must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Terminal Disclaimer

2. The terminal disclaimer filed on June 30, 2003 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of any patent granted on Application Number 09/797,220 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Priority

The continuation information in Page 1 of the specification is incorrect, as the filing date of the cross-referenced application (09/797,220) is June 11, 2001, not March 1, 2001 as listed.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 2, 9-11, 14-16, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paranto et al. US Patent No. 5,621,514 in view of Gross US Patent No. 4,687,281.

Regarding Claims 1, 9-11, 14-16, and 18, Paranto et al. teach (see Fig.) a ladar system comprising a mode locked laser transmitter (26), a receiver (29) adapted to detect signals transmitted by the laser and reflected by an object, and a signal processor (32, 33) for analyzing the signals. Paranto et al. also teach analyzing Doppler sampling (see Col. 2, lines 10-13) to determine velocity (see Col. 3, lines 62-64). Regarding Claim 9, Paranto et al. teach the signal processor including a range demultiplexer (see Abstract, lines 16-18 and Col. 3, lines 60-63) for organizing the signals into range bins. Regarding Claim 10, Paranto et al. teach the signal processor including means for extracting a signal (see Abstract, lines 16-18) representing Doppler frequencies detected for each range bin. Regarding Claim 11, Paranto et al. teach said means for extracting Doppler frequencies including means for computing a frequency spectrum associated with each range bin (see Abstract, lines 16-18). Regarding Claim 14, Paranto et al. teach the signal processor including means for extracting a signal representing intensity (inherent within a "frequency spectrum" output) of the signal detected for each range bin (see Abstract,

lines 16-18). Regarding Claim 15, Paranto et al. teach a local oscillator (27) for generating a reference beam (see Col. 2, lines 37-38). Regarding Claim 16, Paranto et al. teach (see Fig. and Col. 2, lines 49-51) the receiver combining said reflected signal with said reference beam. Regarding Claim 18, Paranto et al. teach (see Fig.) a method for ladar including transmitting (26) a series of mode locked laser pulses (see Col. 2, lines 40-52), receiving and detecting (29) returns of the transmitted signals as the signals are reflected by an object, and analyzing (32, 33) the signals to extract range and cross-range information (see Col. 2, line 64 to Col. 3, line 8). Paranto et al. do not teach the laser transmitter specifically as a synthetic aperture laser transmitter- however Doppler measurements, which Paranto et al. analyzes, are inherently captured by synthetic aperture radar/ladar systems for measurements for analysis of range, velocity, and dimensions. In addition, Gross teaches a ladar system as a synthetic aperture ladar system (see Col. 1, lines 39-41 and 55-59) with a synthetic aperture laser transmitter (using (34)). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a synthetic aperture ladar system and include means for moving said ladar system during operation as taught by Gross in the system of Paranto et al., to provide accurate long-range ladar in space, as taught by Gross (see Col. 1, lines 28-30 and Col. 6, lines 3-4).

Regarding Claim 2, Paranto et al. in view of Gross teach the system in Claim 1, according to the appropriate paragraph above. Paranto et al. do not teach a means for moving said ladar system while said ladar system operates. Gross teaches a ladar system as a synthetic aperture ladar system (see Col. 1, lines 39-41 and 55-59) with means for moving the ladar system (see Col. 5, lines 3-4) while said ladar system operates. It would have been obvious to one of ordinary skill in the art at the time the invention was made to include means for moving said

ladar system during operation as taught by Gross in the system of Paranto et al. in view of Gross, to provide accurate long-range ladar for high-resolution satellite imagery.

5. Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paranto et al. in view of Gross as applied to Claim 1, further in view of Rice et al. US Patent No. 6,061,170.

Paranto et al. in view of Gross teach the system in Claim 1, according to the appropriate paragraph above. Regarding Claim 6, Paranto et al. teach means (26) for pumping the laser via an optical fiber (see Col. 2, lines 40-41). Paranto et al. do not teach the laser as an erbium-doped crystal laser or an erbium, ytterbium-doped laser. Rice et al. teach a laser for a ladar system (see Col. 8, lines 49-51) wherein the laser is an erbium-doped crystal laser (see Col. 2, lines 22-25 and Col. 11, lines 55-62) and erbium, ytterbium-doped (see Col. 2, lines 22-25) laser pumped via an optical fiber (see Col. 2, lines 18-22 and 28-30). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the laser of Rice et al. in the system of Paranto et al. in view of Gross, to increase laser output power for long range ladar, as taught by Rice et al. (see Col. 8, lines 48-51).

6. Claims 3 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paranto et al. in view of Gross as applied to Claim 1, further in view of Kafka et al. US Patent No. 6,421,573.

Paranto et al. in view of Gross teach the system in Claim 1, according to the appropriate paragraph above. Paranto et al. do not teach the laser transmitter including a laser and means for

mode locking the output thereof, said mode-locking means including a quantum well absorber. Kafka et al. teach (see Fig. 1) a mode-locked laser transmitter (10) including a laser (12, 18), and means (19) for mode locking the output thereof, including a quantum well absorber (see Col. 4, lines 57-59 and 65-67). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the laser of Kafka et al. in the system of Paranto et al. in view of Gross, to increase laser output power while utilizing a commonly-constructed laser assembly.

7. Claims 3 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paranto et al. in view of Gross as applied to Claim 1, further in view of Coppock et al. US Patent No. 4,339,821.

Paranto et al. in view of Gross teach the system in Claim 1, according to the appropriate paragraph above. Paranto et al. do not teach the laser transmitter including a laser and means for mode locking the output thereof, said mode-locking means including an acoustic crystal. Coppock et al. teach (see Fig. 1) a mode-locked laser transmitter (10, 18) including a laser (10) and means (18) for mode locking the output thereof, including an acoustic crystal (see Col. 1, lines 49-54 and Col. 2, lines 24-27 and 36-43). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use an acoustic crystal in the laser transmitter as taught by Coppock et al. in the system of Paranto et al. in view of Gross, to provide increased laser efficiency, as taught by Coppock et al. (see Col. 1, lines 45-48).

8. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Paranto et al. in view of Gross as applied to Claim 1, further in view of Phillips et al. US Patent No. 5,835,199.

Paranto et al. in view of Gross teach the system in Claim 10, according to the appropriate paragraph above. Paranto et al. do not teach the means for computing a frequency spectrum including a Fast Fourier Transform. Phillips et al. teach a ladar system (see Col. 3, lines 13-21) using a Fast Fourier Transform (see Col. 31, lines 53-56) to compute and analyze a frequency spectrum (see Col. 31, line 56 to Col. 32, line 6). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a Fast Fourier Transform as taught by Phillips et al. in the means for computing a frequency spectrum in the system of Paranto et al. in view of Gross, to utilize common processors already designed for performing FFT frequency computations, to save costs and simplify system design.

9. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Paranto et al. in view of Gross as applied to Claim 1, further in view of Pearson US Patent No. 4,516,853.

Paranto et al. in view of Gross teach the system in Claim 11, according to the appropriate paragraph above. Paranto et al. do not teach the means for extracting Doppler frequencies further including means for detecting centroids of said frequency spectrums. Pearson teaches a ladar system comprising a mode locked laser transmitter (110, 122, 132) (see Col. 3, lines 2-3 and Col. 4, lines 9-10), a receiver (129, 134) adapted to detect signals transmitted by the laser and reflected (from (172) from an object (170), and a signal processor (127, 220) for analyzing the signals, wherein the centroids of the frequency spectrums are detected (see Col. 3, lines 50-56). It would have been obvious to one of ordinary skill in the art at the time the invention was made to detect the centroids of the frequency spectrums as taught by Pearson in the system of

Paranto et al. in view of Gross, to detect the velocity and movement of the object, as taught by Pearson (see Col. 4, lines 50-56).

10. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Paranto et al. in view of Gross, further in view of Low et al. US Patent No. 3,737,231.

Paranto et al. teach (see Fig.) a ladar system comprising a laser transmitter (26), a receiver (29) adapted to detect signals transmitted by the laser and reflected by an object, and a signal processor (32, 33) for analyzing the signals. Paranto et al. also teach analyzing Doppler sampling (see Col. 2, lines 10-13) to determine velocity (see Col. 3, lines 62-64)- Doppler measurements are inherently used for synthetic aperture radar/ladar systems. Paranto et al. do not teach the laser transmitter as a synthetic aperture laser transmitter and comprising a resonant cavity, a gain medium disposed with the cavity, and a mode locking mechanism in communication with the medium for transmitting a mode locked signal from the cavity. Gross teaches a ladar system as a synthetic aperture ladar system (see Col. 1, lines 39-41 and 55-59) with a synthetic aperture laser transmitter (using (34)). Paranto et al. and Gross do not teach the laser transmitter comprising a resonant cavity, gain medium, and mode locking mechanism in communication with the medium for transmitting a mode locked signal from the cavity. Low et al. teach (see Fig. 1) a laser transmitter for a ladar system (see Col. 1, lines 62-63 and Col. 2, lines 6-11) with a resonant cavity (10), a gain medium (11) disposed with the cavity, and a mode locking mechanism (13) in communication with the medium for transmitting a mode locked signal from the cavity. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the laser transmitter of Low et al. with a synthetic aperture laser

transmitter of Gross in the system of Paranto et al., to provide accurate long-range ladar in space, as taught by Gross (see Col. 1, lines 28-30 and Col. 6, lines 3-4) and to provide ideal optical pulses for ladar purposes, as taught by Low et al. (see Col. 2, lines 29-34) having increased output power (see Col. 2, lines 35-39).

Response to Arguments

11. Applicant's arguments filed June 25, 2003 have been fully considered but they are not persuasive.

Applicant argues that combining the Gross reference with the Paranto reference would not have been obvious, as using a mode locked waveform for synthetic aperture ladar is not obvious due to small pulselets associated with mode-locked waveforms. Examiner asserts that a synthetic aperture ladar system is taught by Gross and combination with a mode-locked laser as taught by Paranto simply provides increased optical energy and defined pulses in order to increase the resolution of the ladar analyzed image, as is well known in the art for ladar systems. The timing and intensity of the pulselets associated with the mode-locked waveform is controlled by the laser transmitter and integrated with the synthetic aperture system within the laser transmitter to provide a controlled laser output, upon combination of Gross with Paranto. Examiner also asserts that synthetic aperture radar is defined as "imaging radar... measuring not only the time delay for the echos returning from the microwave pulse transmitted by its antenna but also their Doppler frequency shift" by the Photonics Dictionary (www.photonics.com). Since Paranto teaches measuring the Doppler shift in the ladar system (see Col. 2, lines 10-13 and Col. 3, lines 62-64), including the additional features of Gross to provide a full synethetic aperture ladar system would have been obvious of one in the art.

Conclusion

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen Yam whose telephone number is (703)306-3441. The examiner can normally be reached on Monday-Friday 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on (703)308-4852. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

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